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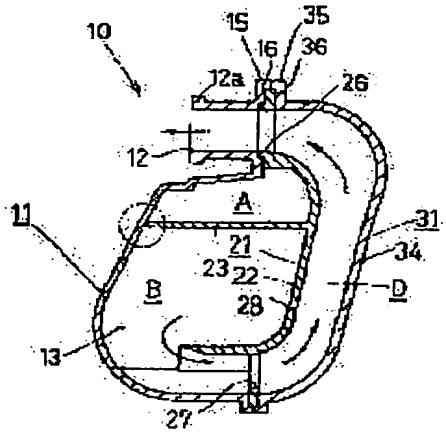
(54) SYNTHETIC RESIN INTAKE MANIFOLD FOR INTERNAL COMBUSTION ENGINE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a synthetic resin intake manifold for internal combustion engines that can compactly form the intake manifold with long ports without complicated bent sections, contains a resonator and can easily be formed and assembled.
SOLUTION: This invention is related to a synthetic resin intake manifold 10 for internal combustion engines, which comprises an intermediate body 21 integrately jointed and held by a first outside half body 11 and a second outside half body 31. The first outside half body 11 is provided with a recessed section 13 for air and an exit port 12, and the intermediate body 21 is provided with a partition plate 23, cylindrical section for a resonator, opening for distribution space, exit side opening, intake side opening, and pipe wall half body section for a branch pipe, and the second outside body 31 is provided with a suction port, wall section for air passage and pipe wall half body section for a branch pipe.



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* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention tends to offer the inlet manifold made of internal combustion engine synthetic resin easy [an assembly] and compact.
[0002]
[Description of the Prior Art] In recent years, the demand about the output characteristics of the engine of an automobile is shifting to the low middle turn high torque mold which thinks practicality as important from the high rotation high power mold which thinks a horsepower output as important. Said low middle turn high torque type of case, in order to gather engine inhalation-of-air effectiveness, it is desirable to lengthen the port (inlet pipe) of an inlet manifold. However, since a large engine space is needed when said port is lengthened, there is a problem by which the habitation space of a vehicle room is narrowed inevitably. The port had to be made into the configuration which wound intricately when it was going to contain the long inlet manifold of said port to the engine space which secured the habitation space of sufficient vehicle room and was moreover restricted. Moreover, the hold space of the resonator connected to an inlet manifold decreased in the engine space, and a possibility that it might become impossible to give the capacity which demonstrates sufficient effect also had it.
[0003] By the way, the injection-molded product of synthetic resin may be used for this inlet manifold for the purpose of lightweight-izing of an automobile in recent years. However, it must divide into the configuration where it can injection mold, finely, and must fabricate in the case of the inlet manifold which has a port which was described above, and which was crooked intricately in it. Therefore, the assembly activity of a subsequent manifold became very complicated, and there was a problem which is not efficient. Moreover, in order for the amount of joint to increase, bolts, gaskets, etc. to be used increase in number and there is also a problem which the weight of the inlet manifold itself increases and it not only becomes cost high, but produces inconvenience in conveyance, or storage and anchoring to the body. Furthermore, there is also a possibility that the sealing performance for a joint may become inadequate.
[0004]
[Problem(s) to be Solved by the Invention] It is going to be proposed in view of such a trouble, and it can form in a compact, without making the long inlet manifold of port length crooked intricately, and, moreover, as for this invention, shaping and an assembly also tend to offer the easy inlet manifold made of synthetic resin for internal combustion engines.
[0005]
[Means for Solving the Problem] Namely, on both sides of intermediate field, as for this invention, coalesce cementation of the first outside half object and the second outside half object is carried out. A gas led to between intermediate field and the first outside half object through a gas path between the second outside half object and intermediate field from an inhalation-of-air hole formed in said second outside half object It is the inlet manifold made of synthetic resin for internal combustion engines discharged from an outlet hole of the first outside half object through two or more branch pipes formed between said intermediate field and the second outside half object. A dashboard with which said first outside half object is equipped with a crevice for gases, and two or more outlet holes, and a crevice for gases is divided into space for resonators, and space for distribution at said intermediate field, A cylinder part for resonators which makes a gas path between the second outside half object and intermediate field open said space for resonators for free passage, A opening for distribution space which makes a gas path open said space for distribution for free passage, and an outlet side opening formed according to said outlet hole, An inspired air flow path opening formed so that it might lead to said space for distribution while making this outlet side opening and a pair, An inhalation-of-air hole which is equipped with two or more tube wall half somata for branch pipes by which swelling formation was carried out towards the second outside half object at the shape of an abbreviation segment between an outlet side opening which makes said pair, and an inspired air flow path opening, and leads inside and outside of a manifold to said second outside half object, A

wall for gas paths which forms a gas path which leads to this inhalation-of-air hole between said intermediate fields, An inlet manifold made of synthetic resin for internal combustion engines characterized by having a tube wall half soma for branch pipes which forms two or more branch pipes which cover a tube wall half soma for branch pipes of said intermediate field, and open between an outlet side opening and an inspired air flow path opening for free passage is started.

[0006]

[Embodiment of the Invention] According to an attached drawing, this invention is explained to details below. In addition, the physical relationship of the upper and lower sides described in the following explanation is the relation on an accompanying drawing, and does not necessarily describe the upper and lower sides in a busy condition. Drawing 1 The cross section of the inlet manifold made of synthetic resin of this invention for internal combustion engines, The cross section from which drawing 2 cut said inlet manifold made of synthetic resin in other locations, Drawing which drawing 3 puts in order drawing showing an example of the first outside half object, its A-A cross section, and a B-B cross section, and is shown, The cross section in which drawing 4 shows the important section of drawing 1 , drawing which drawing 5 puts in order drawing showing an example of intermediate field, and its C-C cross section, and is shown, Drawing which drawing 6 puts in order drawing which looked at said intermediate field from the background, and its D-D cross section, and is shown, the cross section in which drawing 7 shows other important sections of drawing 1 , and drawing 8 are drawings putting in order and showing drawing showing an example of the second outside half object, its E-E cross section, and a F-F cross section.

[0007] As shown in drawing 1 and drawing 2 , the inlet manifold 10 made of synthetic resin of this invention for internal combustion engines consists of the first outside half object 11, the intermediate field 21, and the second outside half object 31 which consist of an injection-molded product of synthetic resin, and coalesce cementation of said first outside half object 11 and the second outside half object 31 is carried out on both sides of intermediate field 21. Said inlet manifold 10 made of synthetic resin discharges the gas led to the space B for distribution through the gas path C from the inhalation-of-air hole 32 of the second outside half object 31 from the outlet hole 12 through a branch pipe D, as shown in the arrow head of drawing 1 and drawing 2 . Since it is allotted so that a port may surround the space A for resonators, even if the inlet manifold 10 made of synthetic resin of this invention lengthens the length of a port, its magnitude of manifold 10 itself is very compact. In addition, in explanation of this invention, the period until it results [from the gas path C] in the outlet hole 12 of a branch pipe D through the crevice 13 for gases was made into the port (inlet pipe). Although there is especially no limitation as suitable synthetic resin for shaping of this manifold 10, the well-known fiber reinforced plastics which have thermal resistance are desirable. In this example, the nylon which added the glass fiber for the nylon which added the glass fiber 35% of the weight 15% of the weight to intermediate field 21 again is used for the first outside half object 11 and the second outside half object 31.

[0008] Said first outside half object 11 is equipped with the crevice 13 for gases, and two or more outlet holes 12. As shown in drawing 3 , the crevice 13 for gases is formed in the abbreviation lower half of said first outside half object 11. The outlet hole 12 is projected to tubed outward at said crevice 13 bottom for gases, and two or more formation is carried out. It was referred to as four in this example. Sign 12a is the engine mounting flange prepared in the outside of said outlet hole 12. Moreover, the flange 15 for cementation is formed in the periphery section of said first outside half object 11. This flange 15 for cementation is for pinching intermediate field 21 certainly and carrying out coalesce cementation with the second outside half object 31 described later, and the intermediate-field pinching side 16 is formed in the inner circumference veranda of a plane of composition. The intermediate-field pinching side 16 is formed in the shape of [of thin meat] a stage, and periphery partial 21a of intermediate field 21 is inserted in a part for the thin-walled part, and it enables it to insert it rather than the surrounding flange 15 for cementation so that I may be understood from drawing 4 . Therefore, the depth of the shape of a stage of this intermediate-field pinching side 16 is good to consider as the abbreviation half of the thickness of the intermediate field 21 to pinch.

[0009] Intermediate field 21 equip the abbreviation plate-like main part 22 with a dashboard 23, the cylinder part 24 for resonators, the opening 25 for distribution space, the outlet side opening 26, the inspired air flow path opening 27, and the tube wall half soma 28 for branch pipes, as shown in drawing 5 and drawing 6 . a main part 22 -- the shape of the appearance -- the periphery configuration of said first outside half object 11, and abbreviation -- similarly it is formed and the dashboard 23 is formed in the field which becomes the first outside half object 11 side. When a dashboard 23 combines said first outside half object 11 and intermediate field 21, it is formed in the length which contacts the wall of said crevice 13 for gases, and divides the crevice 13 for gases concerned into the space A for resonators, and the space B for distribution so that I may be understood from drawing 1 . Moreover, the cylinder part 24 for resonators is for making the gas path C formed by the second outside half object 31 and intermediate field 21 open said space A for resonators for free passage, and is projected

and prepared in said space A for resonators. In addition, in this example, as the slot 19 is established in the wall of the crevice 13 for gases and the tip of said dashboard 23 is attached in the case of an assembly, the partition of the space A for resonators and the space B for distribution is ensured, so that I may be understood from drawing 7 which expands and shows the inside of the circle enclosed with an alternate long and short dash line to drawing 1 .

[0010] Furthermore, the opening 25 for distribution space is for making the space B for distribution formed in the first outside half object 11 side, and the gas path C formed in the second outside half object 31 side open for free passage, and is prepared in said cylinder part 24 bottom for resonators. The outlet side opening 26 is formed corresponding to the outlet hole 12 of said first outside half object, and makes the opening of the branch pipe D of the manifold 10 made of synthetic resin for internal combustion engines carry out outside. Moreover, the inspired air flow path opening 27 makes the outlet side opening 26 and a pair under said main part 22, is prepared, and leads said space B for distribution and branch pipe D. The tube wall half soma 28 for branch pipes is for forming a branch pipe D between the second outside half objects 31 described below, and as shown in drawing, it is formed in the configuration which bulged to the direction of the second outside half object 31 between the outlet side opening 26 and the inspired air flow path opening 27. This tube wall half soma 28 for branch pipes constitutes the inside tube wall portion at the time of dividing the branch pipe D of straight 1 along the length direction. In this example, four tube wall half somata 28 for branch pipes are formed, and four branch pipes D are formed. Tube wall Mabe 28a is prepared between the adjoining tube wall half somata 28 for branch pipes. This tube wall Mabe 28a is the portion which constitutes between the branch pipe D of 1, and the adjoining branch pipes D, and in the case of the fusion of each **** 11 and 31 and intermediate field 21, it sticks with tube wall Mabe 34a of the between wall half soma 34 for between branching of the second outside half object 31, and is joined, and it carries out partition formation of the branch pipe D of a predetermined number. In addition, as shown in drawing, it is the configuration which top edge 27a of the inspired air flow path opening 27 crooked for which and extended to the first outside half object 11 side.

[0011] The second outside half object 31 is equipped with the inhalation-of-air hole 32, the wall 33 for gas paths, and the tube wall half soma 34 for branch pipes, and coalesce cementation is carried out with the first outside half object 11 on both sides of said intermediate field 21. The flange 35 for cementation is formed in the periphery section of the second outside half object 31 like said first outside half object 11. A sign 36 is an intermediate-field pinching side. In addition, when it faces across intermediate-field 21 periphery between said flange 15 for cementation, and 35, the intermediate field 21 concerned are held certainly, and it enables it to join certainly the flange 15 for cementation, and no less than 35 comrades moreover as abbreviation one half of the thickness of intermediate field 21 like [the depth of this intermediate-field pinching side 36] said intermediate-field pinching side 16. The inhalation-of-air hole 32 is a hole which makes the inside and outside of a manifold 10 open for free passage, and is prepared above the wall 33 for gas paths. The wall 33 for gas paths is for forming the gas path C which leads to said inhalation-of-air hole 32 between intermediate fields 21, and a throttle body S etc. is attached outside. The tube wall half soma 34 for branch pipes constitutes the tube wall portion of the outside of the pipe at the time of dividing a branch pipe D along the length direction, it is prepared in the location corresponding to four tube wall half somata 28 for branch pipes of said intermediate field 21, covers the tube wall half soma 28 for branch pipes concerned, and constitutes a branch pipe D. In this example, four tube wall half somata 34 for branch pipes in all are formed in said tube wall half soma 28 for branch pipes. As described above, sign 34a is tube wall Mabe, and is joined to tube wall Mabe 28a of the tube wall half soma 28 for branch pipes of intermediate field 21. The branch pipe D formed of these tube wall half somata 28 and 34 for branch pipes opens between the outlet side opening 26 of intermediate field 21, and the inspired air flow path opening 27 for free passage.

[0012] As the first outside half object 11, the intermediate field 21, and the second outside half object 31 which consist of such a configuration are shown in drawing 4 at the time of the assembly of an inlet manifold, on both sides of periphery partial 21a of intermediate field 21, coalesce cementation of the first outside half object 21 and the second outside half object 31 is carried out by joining in the intermediate-field pinching sides 16 and 36. And it becomes the inlet manifold 10 made of synthetic resin by joining the flanges 15 and 35 for cementation of a periphery, and tube wall Mabe 28a and 34a, and welding and unifying by the suitable method. Since the obtained inlet manifold 10 made of synthetic resin has the cylinder part 24 for resonators which opens for free passage the space [into which the interior of the crevice 13 for gases was divided by the dashboard 23] A for resonators and this space A for resonators, and gas path C middle, it demonstrates a sound absorption operation to the inhalation-of-air gas under gas path C passage. Therefore, the engine space where it is not only economical, but it becomes unnecessary to form a resonator in and an inlet manifold is installed out of an inlet manifold can be widely used now. And since intermediate field 21 serve as the wall of a resonator, and the tube wall of a port, a port serves as a form which surrounded the surroundings of a resonator and was established, and the manifold itself can secure

the long port length very suitable to compact raw for low middle turn high torque operation. In addition, it can also respond to desired frequency by changing a setup of the bore of said cylinder part 24 for resonators, length, etc.

[0013] Furthermore, since the first outside half object 11 and intermediate field 21 which constitute said manifold 10, and the second outside half object 31 are considering the branch pipe D as two piece housing which met in the length direction of a pipe with intermediate field 21 and the second outside half object 31, the economical and efficient production by injection molding is possible for them. Since the amount of [in the case of the assembly] joint is few, there are few components of an and also [an assembly activity is not only easy, but it is necessity at cementation] etc., it ends, lightweight-ization of an inlet manifold can be attained, and, moreover, it is very effective also in mitigation of a manufacturing cost.

[0014]

[Effect of the Invention] With, as above figure example explanation was given, according to the inlet manifold made of synthetic resin of this invention for internal combustion engines, the compact inlet manifold which has long port length can be obtained. And since it has the resonator section inside, it is not necessary to connect with a manifold and to form a resonator, and it is not only economical, but bulky in an engine space. This inlet manifold made of synthetic resin for internal combustion engines is easy, and excellent in workability, and shaping and an assembly are very economical and, moreover, excellent also in sealing performance.

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] An inlet manifold made of synthetic resin for internal combustion engines characterized by providing the following. On both sides of intermediate field 21, coalesce cementation of the first outside half object 11 and the second outside half object 31 is carried out. A gas led to between intermediate field and the first outside half object through a gas path C between the second outside half object and intermediate field from an inhalation-of-air hole 32 formed in said second outside half object It is the inlet manifold made of synthetic resin for internal combustion engines discharged from an outlet hole 12 of the first outside half object through two or more branch pipes D formed between said intermediate field and the second outside half object. A dashboard 23 with which said first outside half object 11 is equipped with a crevice 13 for gases, and two or more outlet holes 12, and a crevice for gases is divided into space A for resonators, and space B for distribution at said intermediate field 21 A cylinder part 24 for resonators which makes a gas path C between the second outside half object and intermediate field open said space for resonators for free passage A opening 25 for distribution space which makes a gas path open said space for distribution for free passage An outlet side opening 26 formed according to said outlet hole, and an inspired air flow path opening 27 formed so that it might lead to said space for distribution while making this outlet side opening and a pair, An inhalation-of-air hole 32 which is equipped with two or more tube wall half somata 28 for branch pipes by which swelling formation was carried out towards the second outside half object at the shape of an abbreviation segment between an outlet side opening which makes said pair, and an inspired air flow path opening, and leads inside and outside of a manifold to said second outside half object 31, A tube wall half soma 34 for branch pipes which forms two or more branch pipes D which cover a wall 33 for gas paths which forms a gas path which leads to this inhalation-of-air hole between said intermediate fields, and a tube wall half soma for branch pipes of said intermediate field, and open between an outlet side opening and an inspired air flow path opening for free passage
[Claim 2] An inlet manifold made of synthetic resin for internal combustion engines characterized by having had intermediate-field pinching sides 16 and 36 which become the inner circumference veranda of a plane of composition of these both flanges from the shape of a stage of thin meat, and said both flanges having joined by this pinching side periphery side in claim 1 while having flanges 15 and 16 for cementation on a periphery of the first outside half object and the second outside half object.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the cross section of the inlet manifold made of synthetic resin of this invention for internal combustion engines.
[Drawing 2] It is the cross section which cut said inlet manifold made of synthetic resin in other locations.
[Drawing 3] It is drawing putting in order and showing drawing showing an example of the first outside half object, its A-A cross section, and a B-B cross section.
[Drawing 4] It is the cross section showing the important section of drawing 1 .
[Drawing 5] It is drawing putting in order and showing drawing showing an example of intermediate field, and its C-C cross section.
[Drawing 6] It is drawing putting in order and showing drawing which looked at said intermediate field from the background, and its D-D cross section.
[Drawing 7] It is the cross section showing other important sections of drawing 1 .
[Drawing 8] It is drawing putting in order and showing drawing showing an example of the second outside half object, its E-E cross section, and a F-F cross section.
[Description of Notations]
10 Inlet Manifold made of Synthetic Resin for Internal Combustion Engines
11 First Outside Half Object
12 Ko Deguchi
13 Crevice for Gases
15 35 Flange for cementation
16 36 Intermediate-field pinching side
21 Intermediate Field
23 Dashboard
24 Cylinder Part for Resonators
25 Opening for Distribution Space
26 Outlet Side Opening
27 Inspired Air Flow Path Opening
28 Tube Wall Half Soma for Branch Pipes
31 Second Outside Half Object
32 Inhalation-of-Air Hole
33 Wall for Gas Paths
34 Tube Wall Half Soma for Branch Pipes
A Space for resonators
B Space for distribution
C Gas path
D Branch pipe

[Translation done.]

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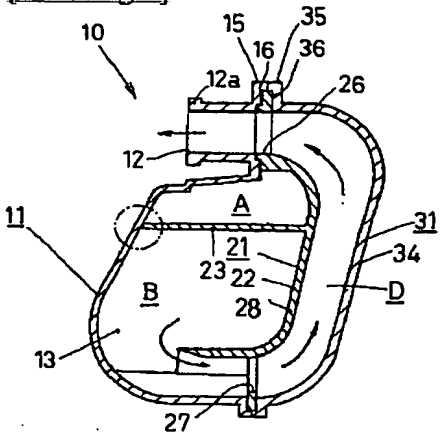
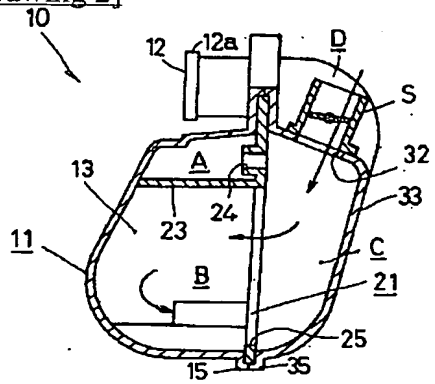
DRAWINGS

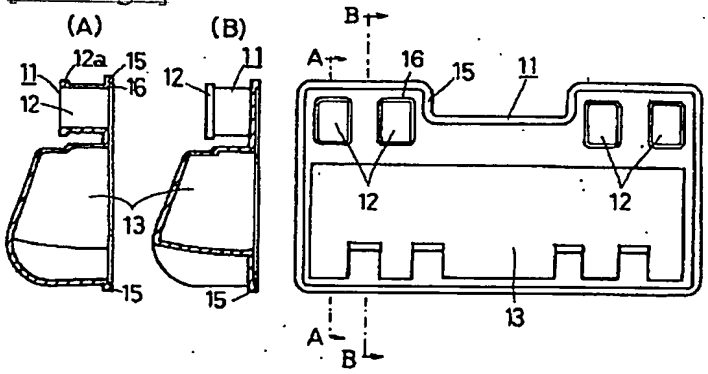
[Drawing 1]



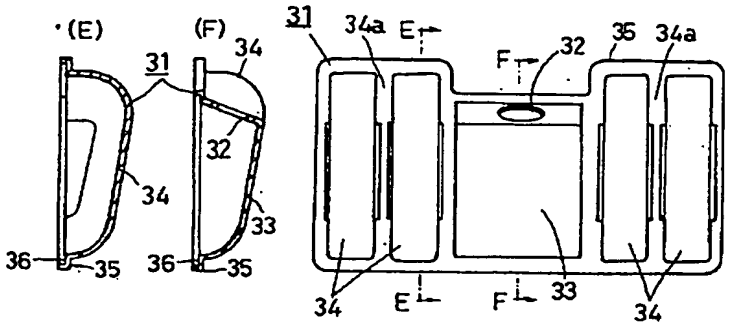
[Drawing 2]



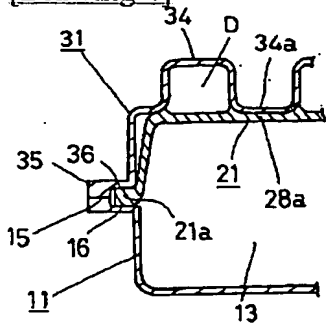
[Drawing 3]



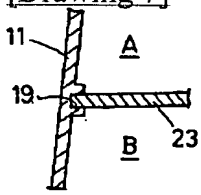
[Drawing 8]



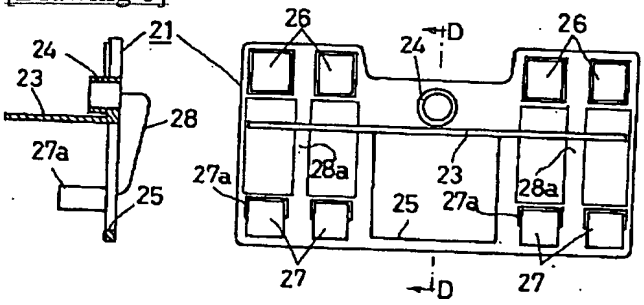
[Drawing 4]



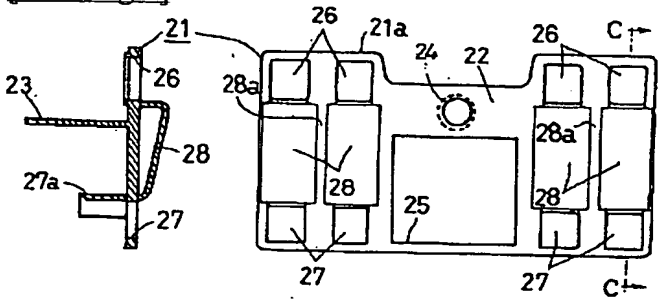
[Drawing 7]



[Drawing 6]



[Drawing 5]

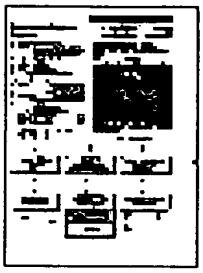


[Translation done.]

Title: **JP10339224A2: SYNTHETIC RESIN INTAKE MANIFOLD FOR INTERNAL COMBUSTION ENGINE**

Derwent Title: Plastic suction manifold for internal combustion engines - includes interstage diaphragm which divides gas passage space into space for distribution and space for resonator [Derwent Record]

Country: **JP** Japan
Kind: **A**



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Priority Number: 1997-06-09 **JP1997000168077**

Abstract: PROBLEM TO BE SOLVED: To provide a synthetic resin intake manifold for internal combustion engines that can compactly form the intake manifold with long ports without complicated bent sections, contains a resonator and can easily be formed and assembled.

SOLUTION: This invention is related to a synthetic resin intake manifold 10 for internal combustion engines, which comprises an intermediate body 21 integrately jointed and held by a first outside half body 11 and a second outside half body 31. The first outside half body 11 is provided with a recessed section 13 for air and an exit port 12, and the intermediate body 21 is provided with a partition plate 23, cylindrical section for a resonator, opening for distribution space, exit side opening, intake side opening, and pipe wall half body section for a branch pipe, and the second outside body 31 is provided with a suction port, wall section for air passage and pipe wall half body section for a branch pipe.

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Family: None

Forward References: **Go to Result Set:** Forward references (1)

PDF	Patent	Pub.Date	Inventor	Assignee	Title
	US6644260	2003-11-11	Tsukii; Tsutomu	Honda Giken Kogyo Kabushiki Kaisha	Intake manifold

Other Abstract Info: DERABS G99-115273 DERG99-115273

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(43)公開日　平成10年(1998)12月22日

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				３０１　Ｌ

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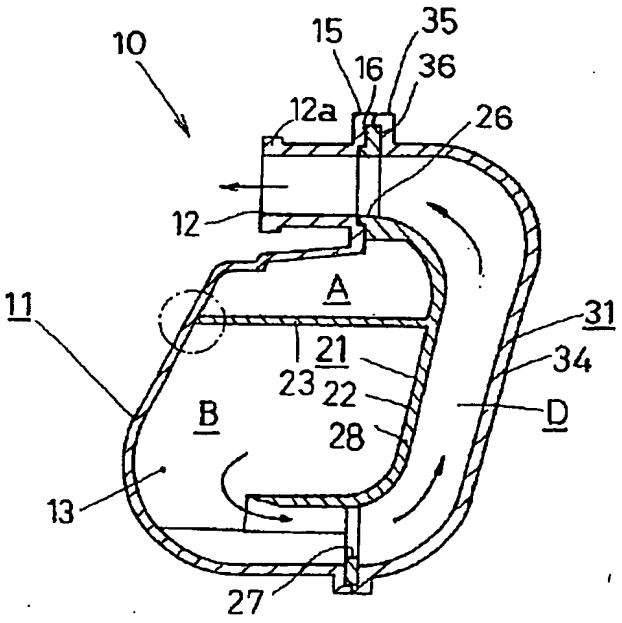
(54)【発明の名称】内燃機関用合成樹脂製吸気マニホールド

(57)【要約】

【課題】　ポート長の長いインテークマニホールドを複雑に屈曲させることなくコンパクトに形成することができ、しかも内部にレゾネータ部を有し、成形および組み立ても容易な内燃機関用合成樹脂製吸気マニホールドを提供する。

【解決手段】　第一外側半体１１と第二外側半体３１が中間体２１を挟んで合体接合された内燃機関用合成樹脂製吸気マニホールド１０であって、前記第一外側半体には気体用凹部１３と出口孔１２を備え、前記中間体には仕切板２３と、レゾネータ用筒部と、分配空間用開口と、出口側開口と、吸気側開口と、分岐管用管壁半体部とを備え、前記第二外側半体には吸引孔と、気体通路用壁部と、分岐管用管壁半体部とを備える。



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【特許請求の範囲】

【請求項１】　第一外側半体１１と第二外側半体３１が中間体２１を挟んで合体接合され、前記第二外側半体に形成された吸気孔３２から第二外側半体と中間体間の気体通路Ｃを介して中間体と第一外側半体間へ導いた気体を、前記中間体と第二外側半体間に形成された複数の分岐管Ｄを通して第一外側半体の出口孔１２から排出するようにした内燃機関用合成樹脂製吸気マニホールドであって、

前記第一外側半体１１には気体用凹部１３と複数の出口孔１２を備え、

前記中間体２１には気体用凹部をレゾネータ用空間Ａと分配用空間Ｂとに仕切る仕切板２３と、前記レゾネータ用空間を第二外側半体と中間体間の気体通路Ｃに連通させるレゾネータ用筒部２４と、前記分配用空間を気体通路に連通させる分配空間用開口２５と、前記出口孔に合わせて形成された出口側開口２６と、該出口側開口と対をなすとともに前記分配用空間と通じるように形成された吸気側開口２７と、前記対をなす出口側開口と吸気側開口間に第二外側半体へ向けて略弓形状に膨出形成された複数の分岐管用管壁半体部２８とを備え、

前記第二外側半体３１にはマニホールドの内外を通じる吸気孔３２と、該吸気孔に通じる気体通路を前記中間体との間で形成する気体通路用壁部３３と、前記中間体の分岐管用管壁半体部に被さって出口側開口と吸気側開口間を連通する複数の分岐管Ｄを形成する分岐管用管壁半体部３４とを備えることを特徴とする内燃機関用合成樹脂製吸気マニホールド。

【請求項２】　請求項１において、第一外側半体と第二外側半体の外周に接合用フランジ部１５，１６を有するとともに、該両フランジ部の接合面の内周縁側に薄肉の段状からなる中間体挟持面１６，３６を有し、該挟持面外周側で前記両フランジ部が接合していることを特徴とする内燃機関用合成樹脂製吸気マニホールド。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、組み立てが簡単でコンパクトな内燃機関合成樹脂製吸気マニホールドを提供しようとするものである。

【０００２】

【従来の技術】近年、自動車のエンジンの出力特性に関する要求は、最高出力を重視する高回転高出力型から実用性を重視する低中回転高トルク型に移行しつつある。前記低中回転高トルク型の場合、エンジンの吸気効率を上げるためには吸気マニホールドのポート（吸気管）を長くすることが好ましい。しかしながら、前記ポートを長くすると広いエンジンスペースが必要となるため、必然的に車室の居住空間が狭められる問題がある。充分な車室の居住空間を確保ししかも限られたエンジンスペースに前記ポートの長い吸気マニホールドを収納しようとすると、ポートを複雑に曲がりくねった形状としなければならなかった。また、吸気マニホールドに接続されるレゾネータの収容スペースがエンジンスペース内に少なくなって、十分な効果を発揮する容量を持たせることができなくなるおそれもあった。

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【０００３】ところで、近年、自動車の軽量化を目的として、この吸気マニホールドに合成樹脂の射出成形品を用いることがある。しかるに、前記したような複雑に屈曲したポートを有する吸気マニホールドの場合では、射出成形可能な形状に細かく分割して成形しなければならない。そのため、その後のマニホールドの組み立て作業が非常に煩雑となって効率的でない問題があった。また、接合部分が増えるため、使用するボルトやガスケットなどが増えコスト高になるだけでなく、吸気マニホールドそのものの重量が増し運搬や保管、車体への取付けに不便を生じる問題もある。さらに、接合部分の密封性が不十分となるおそれもある。

【０００４】

【発明が解決しようとする課題】本発明はこのような問題点に鑑みて提案されたものであって、ポート長の長い吸気マニホールドを複雑に屈曲させることなくコンパクトに形成することができ、しかも成形および組み立ても容易な内燃機関用合成樹脂製吸気マニホールドを提供しようとするものである。

【０００５】

【課題を解決するための手段】すなわち、この発明は、第一外側半体と第二外側半体が中間体を挟んで合体接合され、前記第二外側半体に形成された吸気孔から第二外側半体と中間体間の気体通路を介して中間体と第一外側半体間へ導いた気体を、前記中間体と第二外側半体間に形成された複数の分岐管を通して第一外側半体の出口孔から排出するようにした内燃機関用合成樹脂製吸気マニホールドであって、前記第一外側半体には気体用凹部と複数の出口孔を備え、前記中間体には気体用凹部をレゾネータ用空間と分配用空間とに仕切る仕切板と、前記レゾネータ用空間を第二外側半体と中間体間の気体通路に連通させるレゾネータ用筒部と、前記分配用空間を気体通路に連通させる分配空間用開口と、前記出口孔に合わせて形成された出口側開口と、該出口側開口と対をなすとともに前記分配用空間と通じるように形成された吸気側開口と、前記対をなす出口側開口と吸気側開口間に第二外側半体へ向けて略弓形状に膨出形成された複数の分岐管用管壁半体部とを備え、前記第二外側半体にはマニホールドの内外を通じる吸気孔と、該吸気孔に通じる気体通路を前記中間体との間で形成する気体通路用壁部と、前記中間体の分岐管用管壁半体部に被さって出口側開口と吸気側開口間を連通する複数の分岐管を形成する分岐管用管壁半体部とを備えることを特徴とする内燃機関用合成樹脂製吸気マニホールドに係る。

【０００６】

【発明の実施の形態】以下添付の図面に従ってこの発明を詳細に説明する。なお、以下の説明において述べる上下の位置関係は、添付図面上の関係であって、必ずしも使用状態における上下を述べるものではない。図１はこの発明の内燃機関用合成樹脂製吸気マニホールドの断面図、図２は前記合成樹脂製吸気マニホールドを他の位置で切断した断面図、図３は第一外側半体の一例を示す図とそのＡ－Ａ断面図とＢ－Ｂ断面図とを並べて示す図、図４は図１の要部を示す断面図、図５は中間体の一例を示す図とそのＣ－Ｃ断面図を並べて示す図、図６は前記中間体を裏側から見た図とそのＤ－Ｄ断面図を並べて示す図、図７は図１の他の要部を示す断面図、図８は第二外側半体の一例を示す図とそのＥ－Ｅ断面図とＦ－Ｆ断面図とを並べて示す図である。

【０００７】図１および図２に示すように、この発明の内燃機関用合成樹脂製吸気マニホールド１０は、合成樹脂の射出成形品よりなる第一外側半体１１と中間体２１と第二外側半体３１とからなり、前記第一外側半体１１と第二外側半体３１とが中間体２１を挟んで合体接合されている。前記合成樹脂製吸気マニホールド１０は、図１および図２の矢印に示すように、第二外側半体３１の吸気孔３２から気体通路Ｃを介して分配用空間Ｂに導かれた気体を、分岐管Ｄを経て出口孔１２から排出する。本発明の合成樹脂製吸気マニホールド１０は、ポートがレゾネータ用空間Ａを囲むように配されているので、ポートの長さを長くしてもマニホールド１０そのものの大きさは極めてコンパクトである。なお、本発明の説明では、気体通路Ｃから気体用凹部１３を経て分岐管Ｄの出口孔１２に至るまでをポート（吸気管）とした。このマニホールド１０の成形に好適な合成樹脂として特に限定はないが、耐熱性を有する公知の繊維強化プラスチックなどが好ましい。本例では、第一外側半体１１と第二外側半体３１にはガラス繊維を３５重量％添加したナイロンを、また中間体２１にはガラス繊維を１５重量％添加したナイロンを用いている。

【０００８】前記第一外側半体１１は気体用凹部１３と複数の出口孔１２を備えている。図３に示すように、気体用凹部１３は、前記第一外側半体１１の略下半分に形成されている。出口孔１２は前記気体用凹部１３の上側に外向きに筒状に突出して複数形成される。本例では四つとした。符号１２ａは前記出口孔１２の外側に設けられたエンジン取付用フランジである。また、前記第一外側半体１１の外周部には接合用フランジ１５が形成されている。この接合用フランジ１５は、後で述べる第二外側半体３１とで中間体２１を確実に挟持して合体接合できるようにするためのもので、接合面の内周縁側に中間体挟持面１６が形成されている。中間体挟持面１６は、図４から理解されるように、周囲の接合用フランジ１５よりも薄肉の段状に形成され、中間体２１の外周部分２１ａをその薄肉部分に嵌めて挟むことができるようにしたものである。そのため、この中間体挟持面１６の段状の深さは、挟持する中間体２１の厚みの略半分とするのがよい。

【０００９】中間体２１は、図５および図６に示すように、略平板状の本体２２に、仕切板２３とレゾネータ用筒部２４と分配空間用開口２５と出口側開口２６と吸気側開口２７と分岐管用管壁半体部２８とを備えている。本体２２は、その外形状が前記第一外側半体１１の外周形状と略同じに形成されており、第一外側半体１１側となる面に仕切板２３が形成されている。仕切板２３は、前記第一外側半体１１と中間体２１を組み合わせた際に、図１から理解されるように、前記気体用凹部１３の内壁に当接する長さに形成されており、当該気体用凹部１３をレゾネータ用空間Ａと分配用空間Ｂとに仕切る。また、レゾネータ用筒部２４は、前記レゾネータ用空間Ａを、第二外側半体３１と中間体２１とで形成される気体通路Ｃに連通させるためのもので、前記レゾネータ用空間Ａに突出して設けられている。なお、本例では、図１に一点鎖線で囲んだ円内を拡大して示す図７から理解されるように、気体用凹部１３の内壁に溝１９を設けておき、組み立ての際に前記仕切板２３の先端が嵌着されるようにして、レゾネータ用空間Ａと分配用空間Ｂとの区画を確実にしている。

【００１０】さらに、分配空間用開口２５は、第一外側半体１１側に形成される分配用空間Ｂと第二外側半体３１側に形成される気体通路Ｃとを連通させるためのもので、前記レゾネータ用筒部２４の下側に設けられる。出口側開口２６は、前記第一外側半体の出口孔１２と対応して設けられて、内燃機関用合成樹脂製マニホールド１０の分岐管Ｄを外部に開口させる。また、吸気側開口２７は、前記本体２２の下方に出口側開口２６と対をなして設けられ、前記分配用空間Ｂと分岐管Ｄとを通じている。分岐管用管壁半体部２８は、次に述べる第二外側半体３１との間で分岐管Ｄを形成するためのもので、図のように、出口側開口２６と吸気側開口２７との間に第二外側半体３１の方へ膨出した形状に形成されている。この分岐管用管壁半体部２８は、湾曲する一の分岐管Ｄを長さ方向に沿って分割した際の内側管壁部分を構成している。本実施例では分岐管用管壁半体部２８を四つ設けて分岐管Ｄを四本形成している。隣接する分岐管用管壁半体部２８の間には管壁間部２８ａが設けられている。この管壁間部２８ａは一の分岐管Ｄと隣接する分岐管Ｄとの間を構成する部分で、各半体１１，３１および中間体２１の合着の際に、第二外側半体３１の分岐間用間壁半体部３４の管壁間部３４ａと密着して接合され、所定本数の分岐管Ｄを区画形成する。なお、図のように、吸気側開口２７の上側縁部２７ａが第一外側半体１１側に屈曲し延長した形状となっている。

【００１１】第二外側半体３１は、吸気孔３２と気体通路用壁部３３と分岐管用管壁半体部３４とを備えてお

り、前記中間体２１を挟んで第一外側半体１１と合体接合されている。第二外側半体３１の外周部には前記第一外側半体１１と同様に、接合用フランジ３５が設けられる。符号３６は中間体挟持面である。なお、この中間体挟持面３６の深さも前記中間体挟持面１６と同様に中間体２１の厚みの略半分として、前記接合用フランジ１５，３５間に中間体２１周縁を挟んだ時に当該中間体２１を確実に保持し、しかも接合用フランジ１５，３５同士も確実に接合できるようにする。吸気孔３２は、マニホールド１０の内外を連通させる孔で、気体通路用壁部３３の上方に設けられる。気体通路用壁部３３は、前記吸気孔３２に通じる気体通路Ｃを中間体２１との間に形成するためのもので、外側にスロットルボディＳなどが取り付けられる。分岐管用管壁半体部３４は、分岐管Ｄをその長さ方向に沿って分割した際の管の外側の管壁部分を構成するもので、前記中間体２１の四つの分岐管用管壁半体部２８に対応する位置に設けられ、当該分岐管用管壁半体部２８に被さって分岐管Ｄを構成する。本実施例では前記分岐管用管壁半体部２８に合わせて四つの分岐管用管壁半体部３４が設けられる。前記したように、符号３４ａは管壁間部で、中間体２１の分岐管用管壁半体部２８の管壁間部２８ａと接合される。この分岐管用管壁半体部２８，３４によって形成される分岐管Ｄは、中間体２１の出口側開口２６と吸気側開口２７間を連通する。

【００１２】このような構成よりなる第一外側半体１１と中間体２１と第二外側半体３１は、吸気マニホールドの組立時、図４に示すように、中間体２１の外周部分２１ａを中間体挟持面１６，３６に挟んで第一外側半体２１と第二外側半体３１が溶着により合体接合される。そして、外周の接合用フランジ１５，３５および管壁間部２８ａ，３４ａとを接合し適当な方法で溶着して一体化することにより、合成樹脂製吸気マニホールド１０となる。得られた合成樹脂製吸気マニホールド１０は、気体用凹部１３の内部が仕切板２３によって仕切られたレゾネータ用空間Ａおよび、該レゾネータ用空間Ａと気体通路Ｃ途中とを連通するレゾネータ用筒部２４を有するため、気体通路Ｃ通過中の吸気気体に対して吸音作用を発揮する。従って、吸気マニホールド外にレゾネータを設ける必要がなくなり、経済的であるのみならず、吸気マニホールドの設置されるエンジンスペースを広く使えるようになる。しかも、中間体２１がレゾネータの壁部とポートの管壁とを兼ねているので、ポートはレゾネータの回りを囲んで設けられた形となり、マニホールド自体は極めてコンパクトなままで、低中回転高トルク運転に好適な長いポート長を確保することができる。なお、前記レゾネータ用筒部２４の内径、長さ等の設定を変化させることにより、所望の周波数に対応することもできる。

【００１３】さらに、前記マニホールド１０を構成する

第一外側半体１１と中間体２１と第二外側半体３１は、分岐管Ｄを中間体２１と第二外側半体３１とで管の長さ方向に沿った二分割としているので、射出成形による経済的かつ効率的な生産が可能である。また、その組み立ての際の接合部分が少ないので、組み立て作業が簡単であるだけでなく、接合に必要な他の部品等が少なくて済み、吸気マニホールドの軽量化が達成でき、しかも製造コストの軽減にも極めて有効である。

【００１４】

【発明の効果】以上図示し説明したように、本発明の内燃機関用合成樹脂製吸気マニホールドによれば、長いポート長を有するコンパクトな吸気マニホールドを得ることができる。しかもレゾネータ部を内部に有するため、レゾネータをマニホールドに接続して設ける必要がなく、経済的であるのみならず、エンジンスペース内で嵩張ることがない。また、この内燃機関用合成樹脂製吸気マニホールドは、成形および組み立てが容易で作業性に優れ極めて経済的でありしかも、密封性にも優れている。

【図面の簡単な説明】

【図１】この発明の内燃機関用合成樹脂製吸気マニホールドの断面図である。

【図２】前記合成樹脂製吸気マニホールドを他の位置で切断した断面図である。

【図３】第一外側半体の一例を示す図とそのＡ－Ａ断面図とＢ－Ｂ断面図とを並べて示す図である。

【図４】図１の要部を示す断面図である。

【図５】中間体の一例を示す図とそのＣ－Ｃ断面図を並べて示す図である。

【図６】前記中間体を裏側から見た図とそのＤ－Ｄ断面図とを並べて示す図である。

【図７】図１の他の要部を示す断面図である。

【図８】第二外側半体の一例を示す図とそのＥ－Ｅ断面図とＦ－Ｆ断面図とを並べて示す図である。

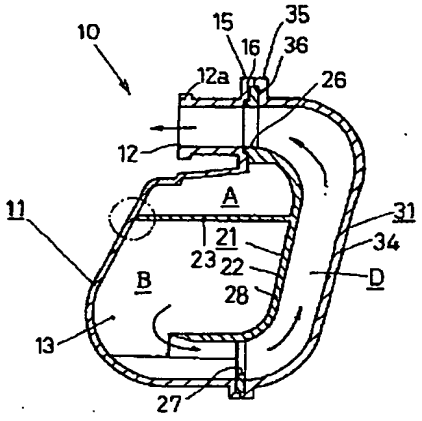
【符号の説明】

１０　内燃機関用合成樹脂製吸気マニホールド
１１　第一外側半体
１２　出口孔
１３　気体用凹部
１５，３５　接合用フランジ
１６，３６　中間体挟持面
２１　中間体
２３　仕切板
２４　レゾネータ用筒部
２５　分配空間用開口
２６　出口側開口
２７　吸気側開口
２８　分岐管用管壁半体部
３１　第二外側半体
３２　吸気孔

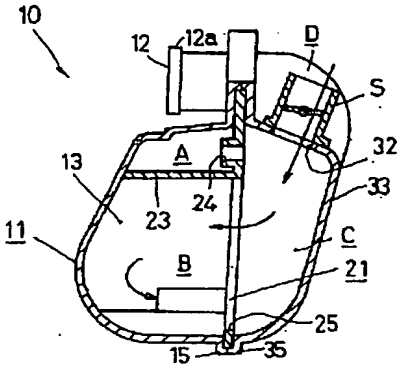
7　　8

３３　気体通路用壁部
３４　分岐管用管壁半体部
Ａ　レゾネータ用空間
Ｂ　分配用空間
Ｃ　気体通路
Ｄ　分岐管

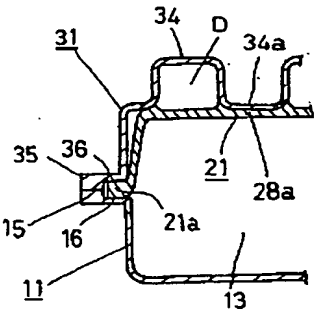
【図１】



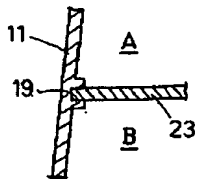
【図２】



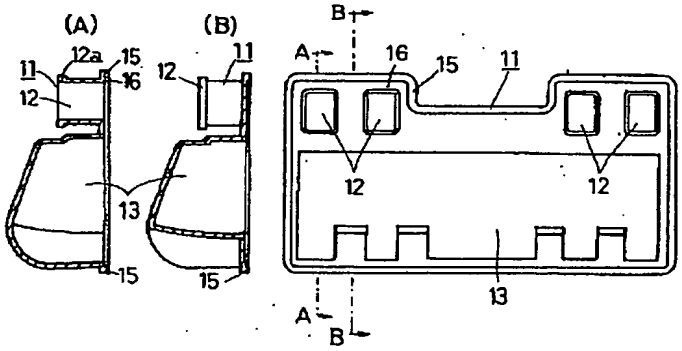
【図４】



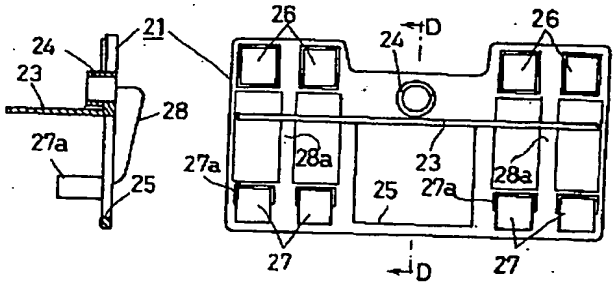
【図７】



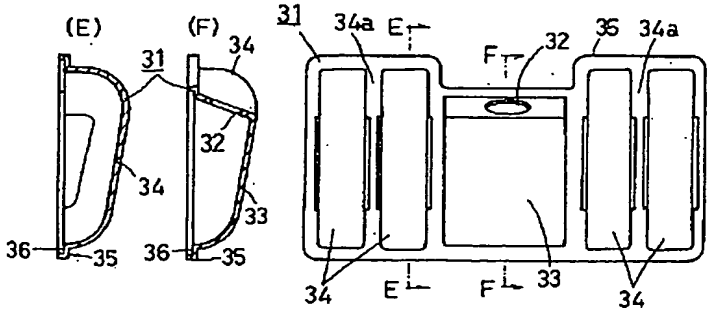
【図３】



【図６】



【図８】



【図５】